

SCIENCE NEWS

NIF built on the Laboratory's seismic safety expertise

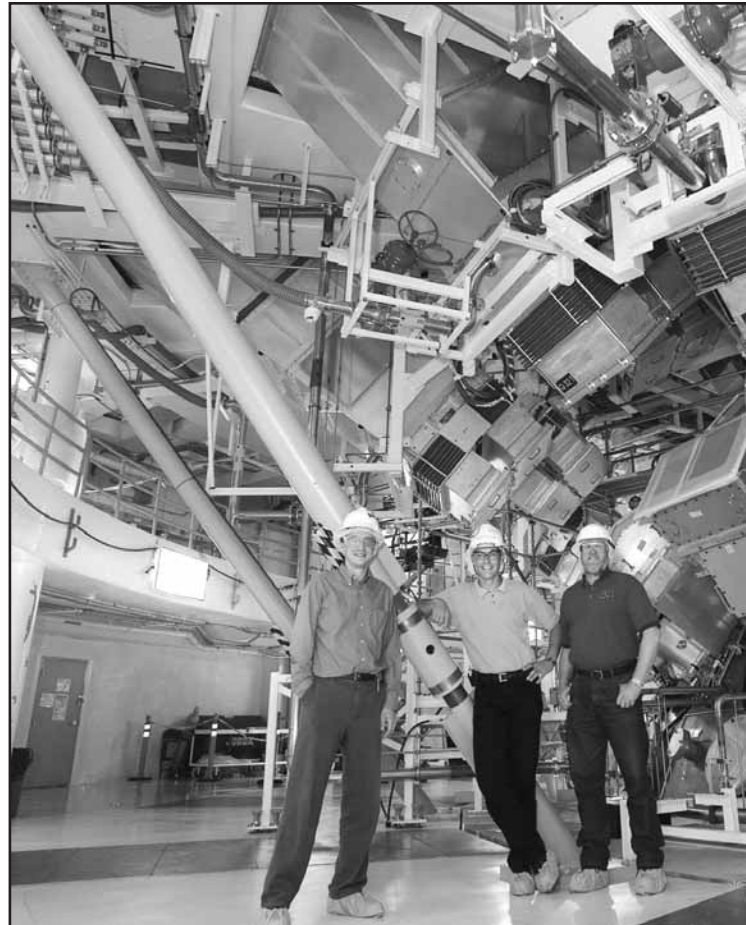
The design and construction of the National Ignition Facility (NIF) demonstrates how far the science of earthquake safety has come in the 100 years since the 1906 San Francisco Earthquake.

"The anniversary of the great earthquake of San Francisco is an opportunity to reflect on how much we've learned and how we've been able to apply our know-how to the design of new buildings and components, as well as strengthening existing structures," said Steve Patterson, associate director for Engineering. "The National Ignition Facility is a fine example of applying the Lab's engineering experience and expertise to earthquake safety."

Laboratory engineers have played a key role in design features of NIF that will help to protect the facility and the components it houses in the event of a temblor; three of those engineers are Stanley Sommer, Dave Trummer and Mike Gerhard.

Beginning in the 1980s, Laboratory engineers Bob Murray, Tom Nelson and Quazi Hossain were instrumental in developing national seismic analysis and design standards while serving on a national committee of the American Society of Civil Engineers. These standards have been applied to the design and construction of NIF, as well as to seismic safety issues throughout the DOE complex.

Seismic engineering expertise has played an important role in the NIF project since its inception. Sommer, Trummer and Gerhard contributed to the design of the NIF laser support structures by performing seismic analyses from the conceptual design review phase of NIF in 1992 to the present. The detailed models developed in the early phase of the project resulted in the configuration for NIF's concrete support structures and the design of structural



JACQUELINE MCBRIDE/NEWSLINE

Stanley Sommer, Dave Trummer and Mike Gerhard stand in front of a NIF target chamber brace, one of the design features of the facility that will help to protect it in the event of a temblor.

steel components.

Throughout the design and construction of NIF, numerous computer simulations and seismic calculations have been used to determine the "seismic loads" for structures holding NIF's optical components securely in place and providing information for peer reviews of NIF designs. Murray contributed to seismic analysis and design during five years with NIF (2000 to 2005) by reviewing Mechanical Engineering Safety Notes and conducting design reviews.

"We took the Labs assessment of the ground motion possible at the NIF site (see April 14 *Newsline*) and designed components to survive ground motion from a major earthquake," Murray said. "We have improved awareness of earthquake hazards throughout the NIF project with periodic inspections. This has led to a culture that looks at the potential consequences of earthquakes on every aspect of the project and designs for their effects."

To adequately protect the NIF facility over its life, it is important that the response of the facility to earthquake excitations be thoroughly understood and validated. To address this need, this complex laser facility was instrumented in order to understand its dynamic response when subjected to earthquake ground motions.

Dave McCallen, Murray and Trummer designed and installed a system of 10 seismographs to meet this need. With seismic instrumentation in place, measurement of system response will provide engineers with important data on how the system responds, and would allow engineers to address any identified issues after an earthquake.